



# The Sustainable Design Process

This section of the training addresses how to integrate sustainable design into the existing DGS design and construction process.

## Application of Sustainable Design

Sustainable design can be beneficial to all project types, including:

- Repairs & Alterations
- New Construction
- Historic Renovations
- Leases



## Integrated Approach

An integrated approach is required for successful sustainable design, but the overall process can vary depending on the building owner, project schedule, and when sustainable design is introduced into a project. (Ideally, sustainable design is considered and integrated into the design process as early as possible.) This section focuses on integrating sustainable design into the Capital Outlay Process.



76.

*The key to sustainable design is to maintain communication between all project team members, including the Department of Finance, the customer, project managers, design team, and building operators.*

## Why Should DGS Integrate Sustainable Design?

California's Sustainable Future: A Blueprint for State Facilities includes the following recommendations:

### Recommendation 1:

Modify the State's capital outlay policies and processes to incorporate the Governor's sustainable building goals.

- Formally establish the Sustainable Building Task Force
- Identify specific modifications to existing capital outlay policies
- Incorporate sustainable building practices into all significant projects
- Require technical review of certain leadership projects by the Task Force

### Recommendation 2:

Incorporate life cycle costing, integrated design, commissioning, and post-occupancy evaluation into the State's Capital Outlay Program.

- Incorporate the use of an integrated design approach in the project development process;
- Develop an applicable life cycle costing method to analyze the full range of quantitative and qualitative sustainable building benefits;
- Establish commissioning and post occupancy evaluation programs to ensure that building performance is periodically monitored and systems operate as designed.

# The Sustainable Design Process



## Notes:

### Integration into Capital Outlay Process

At each step in the Capital Outlay Process, there are opportunities to address some aspect of sustainable design. The phases of the Capital Outlay Process include:

- Concept Phase
- Budget Package Phase
- Site Acquisition
- California Environmental Quality Act Compliance
- A/E Selection
- Preliminary Plans
- Working Drawing Phase
- Construction Documents
- Bidding Phase
- Construction Phase

The following suggestions are provided to encourage opportunities for sustainable design at each step of the Capital Outlay Process:

### Concept Phase or Capital Outlay Budget Change Proposal

Include possible sustainable vision or goals desired.

Examples:

Goal: "This project shall set, as a priority, the integration of renewable energy. Specifically, it is desired to generate at least 5% of the building load from a renewable source".

Goal: "This project shall use rainwater or reclaimed water for all irrigation needs".



# The Sustainable Design Process

## Budget Package Phase

Include sustainable solutions to the extent possible.

Example: If it has been suggested that photovoltaics be utilized on this project, include appropriate numbers in the preliminary budget. Remember that the Department of Finance has agreed to add up to an additional 3% to the A/Es design fees, to be evaluated on a project-by-project basis. These funds can be available if a sustainable design solution is shown to be a beneficial long-term solution.

## A/E Selection - Notification Advertisement

Include intent to provide sustainable requirements.

An example of the Caltrans District 7 Headquarters Evaluators Handbook is included at the back of this section.

## RFQ

Include criteria-specific sustainable design requirements (Tier List requirements at a minimum).

Examples:

“At a minimum the project shall obtain LEED™ Certified status.”

“The project shall meet requirements for an Energy Star Building Label.”

## A/E Evaluation

Include sustainable design in the evaluation requirements.

Example: Caltrans District 7  
Headquarters  
Evaluators Handbook

“Team shall be evaluated in experience, including energy efficiency and sustainable building design.”

“Energy efficiency and Sustainable Design Measures will be evaluated on overall performance of the systems in energy efficiency, sustainable measures including recycling and resource conservation, indoor air quality, alternative energy technologies, and other factors deemed relative.”

## Standard DGS A/E Agreement

Incorporate sustainable design definitions:

Energy efficiency - design that minimizes energy consumption, integrates passive and active design elements, while meeting the operational needs of the facility.

Sustainable building measures - design that results in minimizing pollution, resource waste and environmental impacts associated with facility construction operation, and if applicable, demolition.

Applicable Laws and Regulations  
California Energy Code – Current Edition  
Government Code Section 15814.30-31

Lists of possible energy efficiency and sustainable building measures:

Energy Efficiency Measures – Tier 1 List  
Energy Efficiency Measures – Tier 2 List

# The Sustainable Design Process



Sustainable Building Measures – Tier 1 List

**Notes:**

Sustainable Building Measures – Tier 2 List

Tier List forms must be submitted, at Schematic Design Phase and 50% & 100% Working Drawing Phase.

## ***Tier 1 List Requirements***

All Tier 1 List items are expected to be included in project within established:

- Scope
- Construction budget
- Project schedule

Project shall be designed and constructed within the project construction budget to exceed Title 24 Energy, 2001 Edition by as much as is cost effective.

## ***Tier 2 List Requirements***

Items in the Tier 2 list should be considered for inclusion by the Consultant. If the Consultant concludes that some of the items are feasible, the State should be notified of any additional cost and benefits. This information should be provided to the Project Manager, who in turn will discuss it with the Department of Finance. The customer should also be made aware of such discussions.

## **Preliminary Plans**

### ***Schematics***

### ***Design Development***

1. Identify life-cycle solutions
2. Review plans and specifications for sustainable solutions, which include, but are not limited to: sustainable material selection; energy efficiency; construction waste management; indoor environmental quality solutions; water efficiency.



## The Sustainable Design Process

3. If commissioning is a project requirement, consideration should be given to start the commissioning process in the design phase.

Examples. Expect:

- Development of a preliminary construction waste management plan
- Identification of energy saving devices and systems
- List of reclaimed materials that could possibly be used
- List of other sustainable materials
- Development of an initial indoor environmental quality plan

### Working Drawing Phase/Construction Documents

Review plans and specifications for: sustainable material selection; energy efficiency; construction waste management; indoor environmental quality solutions; water efficiency.

### Bidding Phase

Respond to questions regarding sustainable design and provide contractor with information such as sustainable goals and Construction Waste Management Resources.

### Construction Phase

Confirm that sustainable design solutions are being included, such as:

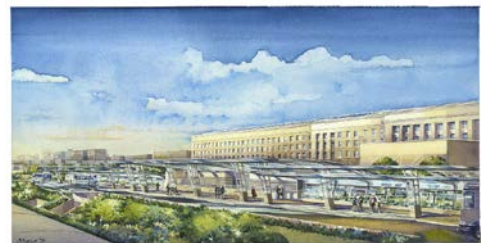
- Continue with commissioning requirements, if applicable
- Follow-up on construction waste management reporting

- Verify that materials selected are installed
- Verify that the Indoor Environment Protection Specification construction practices are being adhered to.

### Other Sustainable Design Strategies

Taking suitable steps during the standard DGS design and construction process may result in the integration of sustainable design solutions. However, the identification and employment of further sustainable design solutions will more likely happen if other methods are used.

Some of these methods are demonstrated by a project scheduled for completion in 2002 at the Pentagon in Arlington, Virginia. The Washington D.C. area light rail system, the Metro, currently makes a stop at the Pentagon. Due to security concerns, the Metro Entrance Facility (MEF) was re-designed to bring Metro and bus traffic further away from the Pentagon.



#### ***Metro Entrance Facility Project Team***

Contractor-led Design Build

Client: Pentagon Renovation Office

Contractor: Hensel Phelps Construction Co.

Architect: HDR Architecture, Inc.

Landscape: Lee & Liu Associates

Mechanical: Southland Industries

Electrical: M.C. Dean

# The Sustainable Design Process



Commissioning: Sebesta Blomberg

## Notes:

This project was a fast-track Contractor-led Design-Build project with a large number of team members. Over the last few years, the Pentagon Renovation Office has been raising expectations for sustainable design on renovation projects.

### Project Requirements

The initial MEF sustainable design requirements were as follows:

Standard Federal Requirements:

- [E.O. 13123, Greening the Government Through Efficient Energy Management](#)
- [10CFR435, Energy Conservation Voluntary Performance Standards for New Buildings](#)
- [EPA 's Comprehensive Procurement Guidelines](#)

Additional MEF Requirements.

Not permitted:

- Ozone-depleting compounds, including CFCs and HCFCs
- Polyvinyl Chloride (PVC) or other chlorine-based compounds
- Volatile Organic Compounds (VOCs)
- If no-VOC is unavailable, low VOC considered with prior approval

Material Selection Requirements

- All dimensional wood and wood products to be wood certified by the Stewardship Council
- Construction waste management, 50% diversion minimum, including metals, wood, asphalt, concrete, land clearing debris, beverage containers, and all other material for which there is a market demand



# The Sustainable Design Process

## Sustainable Design Process

### Sustainable Design Kick-Off Meeting “Problem Seeking”

To better understand complex design problems like the MEF, an initial Sustainable Design Kick-off Meeting is often held with the following goals:

- Ensure that the entire project team understands the project-specific sustainable design requirements
- Establish initial sustainable design project goals
- Clarify Team Commitment and End Expectations
- Describe End Documentation
- Develop a sustainable design vision statement

### Attendees

Attendees at a DGS Kick-Off Meeting could include:

- DGS staff: Finance, Project Directors, Design Staff
- Building Operator
- A/E
- Building Tenant/Building Owner
- Consultants

### Sustainable Vision Statement

The vision statement should be a broad-based description of what the sustainable vision is for a particular project.

For the MEF, it is:

*“The design and construction of the Pentagon MEF will use an integrated, life-cycle approach to create a facility with a 50 year life span that:*

- *optimizes operations and maintenance*
- *reduces long-term cost*
- *minimizes long-term environmental impact*

*In addition, the project should:*

- *integrate with the natural environment*
- *be user-friendly with a sense of place that encourages the use of mass transit. “*



Sustainable Design Kick-Off Notes

Another example of a vision statement is from the remodel of the Department of Transportation in Washington, DC:

*“...design construction and on-going operation of the project must minimize the impact on the environment and the utilization of energy and other scarce non-renewable resources”*

### Initial Sustainable Goals

Initial sustainable design goals should define generally what sustainable achievements are expected. Some of these expectations may be set by the building owner. The project team may set others. Based on their expertise, the team can set initial targets for sustainable design performance.

For example, on the MEF, there was an overall effort to achieve, at a minimum, a LEED™ Certified Rating.

MEF project-specific goals included:

# The Sustainable Design Process



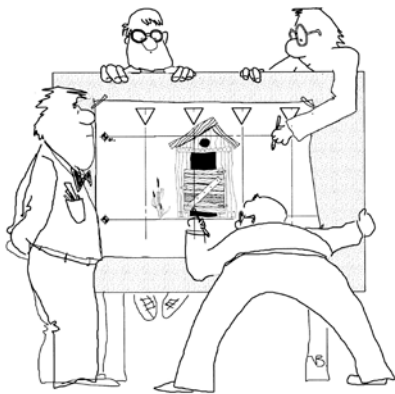
- Recycle at least 50% of all construction waste (set by the Pentagon Renovation office)
- 50% of all materials should have some recycled content (set by the Pentagon Renovation office)
- Exceed ASHRAE 90.1 energy efficiency requirements by 20% (set by the project team)
- Utilize native, low-maintenance vegetation (set by the project team)

## Notes:

### Green Design Charrette

#### ***“Problem Solving”***

After the preliminary investigations from the Kick-Off Meeting are concluded, the Design Team is ready to begin with the problem-solving stage. Often this is begun with a *charrette* – a group design/brainstorm session of limited time. Solutions are energetically conceived and presented. The lessons learned are documented with a future plan of action.



### Sample Green Design Charrette Agenda

- Confirm goals are criteria-specific
- Brainstorm; consider multiple options
- Evaluate cost, feasibility
- Refine solutions; narrow options





## The Sustainable Design Process

- Document materials and systems
- Record findings with specific recommendations
- Describe further research to be done
- Commit to a strategic plan of action
- Concrete with high-content fly ash
- Recycled content ceiling tiles and floor tiles
- Recycled-content carpet backing
- Reprocessed paint
- Cellulose insulation

### Ideas for specific sustainable goal-setting

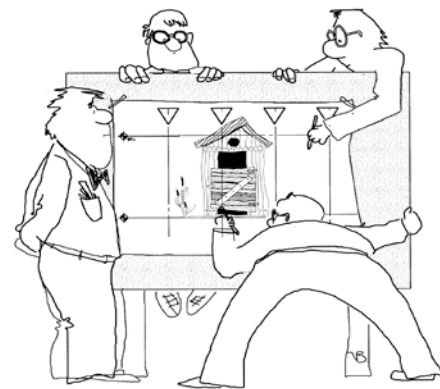
1. The CA LEED™ Supplement and Tier Lists.
2. It is also recommended that goals be set in each sustainable design category:
  - Site Planning
  - Energy Efficiency
  - Materials & Resources
  - Safeguarding Water
  - Indoor Environmental Quality
3. Utilize tools such as the Green Building Advisor.
4. The team should remember that in addition to setting goals for environmental performance, the overall goal is to design quality spaces that also meet the project scope.

### Sustainable Design Solutions

Sustainable design solutions are strategies or methods for achieving the sustainable design goals. For example the **MEF** was expected to exceed ASHRAE 90.1 energy efficiency requirements by 20%. To achieve this the following *solutions* were suggested:

- Install an Energy Star Roof
- Employ a Commissioning Process
- Use Photovoltaics to generate electricity.

To meet the goal that 50% of all materials should have some recycled content, the following *materials* were recommended:



### Considering Sustainable Solutions

After initial sustainable solutions are identified, they should be considered just as any other potential design solution. They should be evaluated, as such, for cost, feasibility, ease of installation, etc.

### Document materials and systems

The possibility of successfully integrating sustainable design on any project can be increased by making sustainable design a regular part of project meetings and by developing some method of tracking progress. An example of the **tracking form** used on the Pentagon Metro Entrance Facility is included in this section.

# The Sustainable Design Process



## Resources

Resources such as the [Building News](#) web site or tools such as the Green Building Advisor™ may be useful to develop initial project goals and solutions.

Notes:

## The Green Building Advisor™



The Green Building Advisor is an interactive software that can be used to identify potential strategies for green building design. Over seven hundred solutions can be reviewed. Information about a particular project can be input in order for the program to process solutions that might be most appropriate to the characteristics of a particular renovation or new construction. In this case, the software sorts the solutions according to those that are:

- Strongly Recommended
- Moderately Recommended
- Not Recommended

The solutions are organized by those categories of sustainable design that have already been presented in this training, including:

- Site & Ecosystems
- Energy Use
- Water Use
- Resources & Materials
- Indoor Environment



## The Sustainable Design Process

The software also contains numerous case studies, sustainable product listings, technical articles, and links to Internet resources.

### Barriers to Sustainable Design

There are a number of barriers to sustainable design. They include:

#### 1. ***Incomplete integration***

- a. Each project phase is typically isolated.
- b. Feedback and reporting mechanisms are lacking.

Recommendation: Encourage communication throughout the design regarding process and solutions. Share lessons learned.

#### 2. ***Focus on first costs***

Recommendation: Identify as early as possible those solutions that may have a positive impact on long-term cost. Provide information to Finance regarding these solutions and specific calculations showing estimates of long-term economic benefits.

#### 3. ***Lack of an accepted life cycle costing methodology***

- a. Lack of agreed-to variables to utilize in life-cycle models.
- b. Frequently additional up-front costs are recoverable.

Recommendation: Encourage the Department of Finance to participate in project discussions on life-cycle decisions.

#### 4. ***Insufficient building performance and operating standards***

- a. No uniform building performance and/or operating standards for state buildings.

Recommendation: Consider existing standards such as Title 24 as a minimum and strive to exceed where possible.

#### 5. ***Lack of incentives***

- a. Builders and designers do not profit directly from a building's operational cost savings, environmental performance or worker productivity.

Recommendation: State may develop incentives that not only promote sustainable building but also reward its application.

#### 6. ***Failure to comply with state laws***

- a. Recycled-content product procurement statutes, for example.

Recommendation: Recognize that fines can be imposed for non-compliance. Also become familiar with resources to assist in meeting such requirements as most of them are reasonable and will not take an extraordinary amount of time.

#### 7. ***Concerns about specific technologies***

- a. Unfamiliarity with products, technologies, and systems.

Recommendation: Do not try to implement a huge quantity of sustainable solutions initially. Instead, select a smaller number of new technologies or products most likely to have the biggest long term impact for evaluation. Then be sure to record any research or conclusions drawn for use on future projects.

### Other DGS Initiatives

DGS sustainable design requirements are not intended to take priority over any other DGS initiatives. In fact, sustainable design should compliment other programs such as the DGS Excellence in Public Buildings Initiative and the Golden Seal Program.

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i This manual is being developed as part of a ten-point plan to implement the Governor's sustainable building goal as outlined in

# The Sustainable Design Process



## Notes:

Executive Order D-16-00 and the report Building Better Buildings: A Blueprint for Sustainable State Facilities (Blueprint). Task 7 of the Blueprint calls for developing sustainable building technical assistance and outreach tools, including a training program for state departments, as well as local government and private sector partners. This manual was developed by DGS, the Sustainable building task force, and CIWMB as one component of the sustainable building training program for state departments. This document will be undergoing constant revision as other deliverables outlined in the Blueprint are completed and technological and process breakthroughs advance the rapidly emerging field of sustainable design.